Impacting Effective Teaching and Learning Process in Schools Through Information and Communication Technology (ICT)

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*Abstract--*The need to completely employ information and communication Technology(ICT) in the teaching and learning process cannot be over emphasized as it will facilitate teaching and learning process, help learners develop creative thinking and self-confidence, create conducive learning environment, etc. ICT is an indispensable tool in teaching and learning process as courses like mathematics, Engineering, Earth sciences, etc.are made easier to both teachers and learners. Educational system cannot be left behind in the adoption of ICT as its advantages outweighs its challenges. The manual teaching and learning process has been dropped in most countries of the world hence any Educational system not completely employing ICT may not meet the challenges of its society nor measure itself among the ever changing communities of the world. This paper suggests that effective introduction of ICT in the teaching and learning process is an indispensable means of improving it.

Keywords: Computer aided instruction, Expert system, intelligent tutoring System, E-learning, Database Management system

I. INTRODUCTION

Technology is developed to solve problems associated with human need in more productiveways. If there is no problem to solve, the technology is not developed and/or not adopted.Applying this principle to educational technology would mean that educators should createand adopt technologies that address educational problems, of which there are many. Further, a technology will not be adopted by educators where there is no perceived need orproductivity gain. This is what Lankshear and Snyder (2000) refer to as the 'workability'principle. Therefore, when discussing applications of computer technology to education thequestion must always be asked, "What educational problem(s) needs to be addressed?"This question needs to be asked at all levels of decision-making, from the teacher planning a programme, to a school administrator purchasing hardware and software, to an educationalsystem officer developing policy and strategic plans.At the teacher level the question becomes: am I satisfied with the educational opportunities Iam able to offer children in school classrooms? While teachers should never be completelysatisfied, and they will always strive to do better, the question really is whether what theyprovide adequately develops the potential of the students and adequately prepares them fora productive life in society. Many educators (e.g. National Centre for Vocational EducationResearch, 2002) and educational commentators (e.g. Murdoch, 2001) believe that what is during the late 1970s and early 1980s, computers became more affordable to schools,

The use of Information and Communications Technologies (ICT) in schools is taken very seriously bygovernments and education systems around the world.

As educational institutions move towards the mainstream use of ICT in teaching and learning thereappear to be some critical steps and vital ingredients needed for the successful infusion of ICT intoeducational environments. Although standalone computers have been in most schools for more thantwo decades now, networked ICT is relatively new for many schools as they continue to grapple with how to use ICT to enhance teaching and learning environments.Since the development of the first computers many have argued that computers should be used to support

learning. These arguments have amplified as computers have evolved into the powerful relatively lowcosttechnology available today. However, there is considerable debate over how computers shouldbe used in schools (Riel, 2003)

This paper focuses on the use of ICT in schools by students and teachers to supportthe processes of learning and teaching. It will aim to describe the ways in which teachers could and/orshould facilitate student use of computer systems and how they can progress. This paper begins with a background to the use of computers in schools, touching

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on a rationale forcomputers in schools. This leads into a discussion of theprofessional development needs of teachers for the progression of using ICT in learning and teaching.

II. SCHOOLS, LEARNING AND COMPUTERS

Schools and educational systems must provide the infrastructure and support for studentsand teachers, and the maintenance of constructive learning environments in which ICT isused. At the same time ICT tools will assist schools and educational systems in carrying thisout.Research has consistently shown that few schools and teachers implement ICTsupport to a degree where the potential benefits are likely to be realized. There are anumber of significant problems which impede and prevent teachers from achieving the fulladvantage offered by ICT applications. Cradler (2002) gave seven requirements foreffective use of ICT in education:

1.Suiting technology to education goals and standards

    2.Having a vision for the use of technology to support curriculum

    3. Providing for both in-service and pre-service training

    4.Ensuring access to appropriate technology

    5.Providing for administrative support for technology use

    6.Providing time for teachers to plan and learn how to integrate technology

7.Providing for ongoing technical support for technology use

In general, these requirements fall into five areas of impact:

1. providing the infrastructure of hardware and software,
2. providing curriculum and technical support for teachers,
3. school organization, design, policies and practices, schooling, andmanagement support.

Any discussion about the use of computer systems in schools is built upon understandings of the linkbetween schools, learning and computer technology. When the potential use of computers in schools
was first mooted, the predominant conception was that students would be 'taught' by computers(Mevarech, Light, 1992). In a sense it was considered that the computer would 'takeover' the teacher's job in much the same way as a robot computer may take over a welder's job.

 Broadly speaking,computer literacy is a component of Technology education, which is distinct from using technologiessuch as computer systems to support learning and teaching processes. The latter is generallyreferred to as educational technology; and is applied to a wide range of technologies such asblackboards and chalk, pencils, books, and slide-rules to television, facsimiles, and computers. Thispaper will focus on the use of computer systems as educational technologies. Since the beginning of the 1990s, educators have been particularly concerned that very little of thepotential of computers to support learning in schools seems to have been realized, despite a sufficientinstalled base of computers. One of the reasons oftengiven for this anomaly is that thetechnology is not sufficiently accessible,

particularly if students haveto go to a special room to gain access.The 1990s was the decade of computer communications and information access, particularlywith the popularity and accessibility of internet-based services such as electronic mail andthe World Wide Web. At the same time the CD-ROM became the standard for distributingpackaged software (replacing the floppy disk). This allowed large information-basedsoftware packages such as encyclopedia to be cheaply and easily distributed. As a result,educators became more focused on the use of the technology to improve student learningas a rationale for investment.

Today computers in schools are both a focus of studies in themselves (technology education)and a support for learning and teaching (educational technology). Rationales can bepresented for both computer literacy and using computers as part of educational technology. It has been argued earlier that ICT is a mediator of learning as a component of the learningenvironment. It is generally agreed that in education the unique instructional characteristics of computers
needs to be exploited (Committee on Developments in the Science of Learning, 2000).

There are four distinct characteristics of computer technology which have clear implicationsfor using computers in the classroom: logical programming, interactive control, graphics andaudio output, and information processing. There are many ways in which thesecharacteristics could be used and have been shown to support students and teachers inimproving learning outcomes and increasing productivity. The degree to which each of theseshould be applied will depend on an array of variables such as the developmental age andpersonal characteristics of the student, the characteristics of the learning environment, andthe nature of the curriculum content.

Providing the Infrastructure
The infrastructure requirements may be viewed in terms of the electronic resources,
hardware, users, and implementation. The relative lack of good quality software and
associated courseware is well documented and is being attended to by software producersand educators throughout the world. The problems associated with hardware were mainly alack of it however there is still a major problem with the appropriateness of the hardwareused. The use of inappropriate hardware, the lack of useful software and the difficulty in gainingadequate access to computer systems were noted as major obstacles to the use ofICT by teachers and students. The choice and distribution of hardware and softwareare crucial to the success of computer use in schools. In the establishment of the computer's place in the school curriculum, the school needs to carefully consider the establishment of a library of software able to support the use of the ICT in the ways established in the school's computing philosophy. Schools with a small computing resource would probably need to buy software likely to have wide use in the school. Many packages are of limited use and can only be used for a small number of functions

within a limited age group. Some packages require individual access to be of use to the teacher. These may best be used in schools with more resources. Some packages are more easily integrated into the curriculum than others which may require a degree of teacher involvement and preparation. Many teachers prefer to use software which requires little teacher preparation and planning. In such instances the software can often determine the content of subsequent lessons rather than the teacher or the plannedcurriculum. When a teacher is made to plan the ways in which the computer will be used, it islikely that the use will be more applicable to the curriculum and more useful to the teacherand students

Electronic Resources

If the aim is to provide more student-directed learning experiences, then students need to beprovided with access to extensive sets of resources which is only feasible using predominantly electronic resources. These resources will consist of data files and softwareapplications (programs) that may be distributed online or on disc. Therefore, schools andsystems need to provide teachers and students with ready and easy access to theseresources. Increasingly, this access will be online, particularly for data files, and while thereis a huge quantity of such resources there are two major problems:
1. Accessing high quality resources,
2. Choosing appropriate resources.

Networking
The networking of educational technology resources benefits students, teachers and schoolsby facilitating information technology learning activities, giving ready access to software,
allowing a variety of communications, reducing costs of equipment, increasing processingpower, and facilitating the management of student learning (Cradler & Bridgforth, 2002).
Three categories of network scenarios should be considered in the use ofcomputer networks in schools.
1. intra-school networks
2. inter-school networks
3. external networks (Internet)

Hardware Organization for Adequate Access
There are a number of methods which can be used to distribute access to
a school'sComputer/ICTsystems. This depends on the number of facilities available.

Laboratory. A group of computers /ICT equipment are made available in a central location which may
be booked by a teacher. This may be a dedicated classroom, part of the library or
part of a learning resource Centre.

Mobile Trolleys. A desktop computer /ICT equipment can be put on a trolley which a teacher may book
and wheel into the normal classroom.

Mobile Laboratory. A number of reasonably portable computers /ICT equipment (ideally notebook or palmtop size computers) may be available for a teacher to book for a lesson. The
Computers /ICT equipment are brought in and set up for the lesson and returned at the end.

Classroom Computer(s). One or more computer(s) /ICT equipment may be allocated permanently to a teacher's classroom.

III. IMPACT ON THE LEARNING ENVIRONMENT

ICT has the following impacts on the learning environment:

Investigating Reality and Building Knowledge
ICT allows students to investigate more thoroughly the real world. They can more readily access informationsources outside the classroom and can use tools to analyze and interpret such information.Information may be accessed through online systems or through data logging systems.

Active Learning and Authentic Assessment
In many classroom situations it is difficult to allow students to be sufficiently active as
participants. Typically, students are often passive, spending a lot of time listening or reading. It is well known that students are more likely to be interested and attentive and will achieve awider range of learning outcomes if they can be active Theirengagement with the curriculum will increase as they are afforded opportunities to createtheir own information and represent their own ideas Computer software can beused to provide students with learning experiences where they are interacting with the computer system.

Engage students by Motivation and Challenge
The interactive and multimedia nature of modern computer systems has provided the
opportunity for software developers to create increasingly more stimulating features.
Computer systems do provide the opportunity tocreate a wide range of interesting learning experiences. This is likely to help to maintain student interest and interest a wider range of students (Cradler & Bridgforth, 2002). The interactive and multimedia
features within software can be used to help students grapple with concepts and ideas.

Provide Tools to Increase Student Productivity
In the past students have spent a lot of time doing repetitive, low-level tasks particularly
involving writing, drawing and computation. While it may be necessary for students to
develop these skills at some time on most occasions they are pre-requisite to some higherleveltask. Unnecessary repetition of low-level tasks is inefficient, non-motivational and mayobscure the real purpose of the learning activity. Many computer applications provide thetools to support

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students in quickly completing these lower-level tasks so that they can focuson the main purpose of the activity. Word processors, graphics packages, databasepackages, spreadsheets and other software support the performance of students.

Student Learning

There are many potential uses for computers in the learning process. In some situations
changes in relevant industries makes computer use in schools imperative. For example, toprovide courses in music, technical drawing, statistics, and business which do not
incorporate computer use reduces the relevancy of the courses to the real world. Here therationale cries out from the work place but needs to be responded to with carefully
Impact of ICT on Learning & Teaching.

Management of Learning Experiences

The management of high quality educational programmes requires and generates large
quantities and types of data. Teachers face many management problems which when
analyzed could be suitable for a computer solution. There are many such tasks which maybe both time consuming and tedious for which teachers should consider a computer solution.Such tasks may include: the organization of assessments, the maintenance of libraryfunctions, the preparation of reports and the organization of events. There are many schoolmanagement packages which will complete tasks such as these and thereby free up asubstantial amount of time for other more important tasks. Schools should make use of theopportunity to continually provide more appropriate solutions to the dynamic problemsassociated with the provision of schooling.

IV.   IMPACT ON THE CURRICULUM

Earlier it was argued that there is a two-way relationship between ICT and the curriculumwhere ICT may be used to assist in conveying the curriculum but at the same time maychange the content of the curriculum. Further, research has shown that the effectiveness inthe use of ICT to support learning is a function of the curriculum content and the instructionalstrategy such that when appropriate content is addressed using appropriate strategiesstudents and teachers will benefit (Cradler & Bridgforth, 2002). The impact of ICT oncurriculum content may be viewed in terms of:

- Declarative knowledge - describes objects and events by specifying the propertieswhich characterize them.
- Procedural knowledge - focuses on the processes needed to obtain a result.

. Most educators would perceive the impact of ICT on the curriculum to be positive. With theuse of ICT students can use more primary source material and be encouraged to addressreal problems and develop analytical and interpretive skills. The classroom can

be transformed into a learning community making it possible for many more people to be apart of the learning process in an open and continuing dialogue. While the impact will be evident on almost all disciplines of learning, the degree will vary
substantially(Becta, 2002).

Impact on Teachers and Pedagogy

Teachers are a key component in the learning environment and therefore the impact of ICTon teachers and the strategies they employ to facilitate the environment are critical.
The impact on teachers varies although some general areas of impact may be identified as,
1. the balance of roles they play with a perceived risk of reduced influence.
2. providing greater access to information, leading to increased interest in teaching andexperimentation (Cradler & Bridgforth, 2002).
3. requiring more collaboration and more communication with teachers, administrators andparents (Cradler & Bridgforth, 2002),
4. requiring more planning and energy,
5. requiring the development of skills and knowledge of ICT, and
6. providing more time to engage with students, leading to greater productivity (Cradler &Bridgforth, 2002).

The impact on pedagogy can be summarized as being strategies that are,
1. more learner-centred,
2. more cooperative and collaborative,
3. more active learning, and
4. based on greater access to information and sources of information.

CONCLUSIONS

The use of ICT has led to easy programming and processing, ICT has helped the schools to eliminate waste and increase performance. The huge manpower spent has been drastically reduced with ICT thereby enhancing overall management procedures. Use of computers has added great speed and accuracy to each task of school administration. It is also more convenient now to store large quantities of information on small and more convenient hardware like disks, pen drives and compact discs. Due to the changes and growth, every society is now dependent on ICT to fast track such growth parameters. Therefore, the Curriculum design in every society should take into account the necessary technological input required to develop thesociety. ICT is a major agent of change in any society.

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